

WHAT IS CLAIMED IS:

- 1 1. A method for controlling a clamping voltage across a terminal of a transistor comprising:
2 providing a first clamping voltage in a conductive loop that includes the terminal of the
3 transistor for a first specified period of time;
4 reducing the first clamping voltage to an intermediate clamping voltage;
5 holding the intermediate clamping voltage for a specified period of time; and
6 repeating the reducing and the holding until the intermediate clamping voltage is
7 essentially equal to a final clamping voltage.
- 1 2. The method of claim 1, wherein intervals between clamping voltage levels are equal.
- 1 3. The method of claim 2, wherein the first specified period of time and the specified period
2 of time are equal.
- 1 4. The method of claim 1, wherein intervals between clamping voltage levels are different.
- 1 5. The method of claim 1, wherein the terminal is a gate of the transistor.
- 1 6. The method of claim 1, wherein the terminal is a drain of the transistor.
- 1 7. The method of claim 1, wherein the transistor is a field effect transistor.

- 1 8. A method for rapidly removing a current from an inductive load without current
2 undershoot comprising:
3 setting a variable current source to produce a first current;
4 holding the variable current source output for a first period of time;
5 checking if a terminating condition is met;
6 setting the variable current source to produce a second current for a second period of
7 time, wherein the second current is smaller than the first current, if the terminating condition is
8 not met; and
9 repeating the checking and the setting.
- 1 9. The method of claim 8, wherein the terminating condition checks to see if a voltage
2 across the inductive load has reached a specified threshold.
- 1 10. The method of claim 8, wherein the terminating condition checks to see if the variable
2 current source has produced all of the currents in a specified sequence of currents.
- 1 11. The method of claim 8, wherein a change between consecutive pairs of currents is the
2 same.
- 1 12. The method of claim 8, wherein a change between consecutive pairs of currents can
2 differ, and wherein a change between consecutive pairs of currents decreases each time the
3 variable current source produces a different current.
- 1 13. The method of claim 8, wherein each current is produced for a specified period of time,
2 and wherein all specified periods of time are equal.

1 14. A circuit comprising:
2 a driver circuit coupled to an inductive load, the driver circuit containing circuitry to
3 control a current built up across the inductive load; and
4 a voltage varying circuit coupled to the driver circuit, the voltage varying circuit
5 containing circuitry to produce a sequence of voltages.

1 15. The circuit of claim 14, wherein the sequence of voltages is a decreasing sequence of
2 voltage levels.

1 16. The circuit of claim 14, wherein the voltage varying circuit comprises:
2 a variable current source to produce an output current of variable magnitude depending
3 upon an input signal; and
4 a snub resistor coupled in parallel to the variable current source.

1 17. The circuit of claim 16, wherein the snub resistor is coupled to the variable current source
2 via a switch.

1 18. The circuit of claim 16, wherein the variable current source comprises:
2 a plurality of current sources, each current source capable of producing a current at a
3 fixed magnitude; and
4 a plurality of switches, each switch serially coupled to the one current source from the
5 plurality of current sources.

1 19. The circuit of claim 18, wherein the input signal can be used to control the state of each
2 switch from the plurality of switches.

- 1 20. The circuit of claim 18, wherein the variable current source produces an output current
2 equal to the sum of the individual current sources which have their switches closed.
- 1 21. The circuit of claim 18, wherein the currents produced by the current sources are equal.
- 1 22. The circuit of claim 18, wherein the currents produced by the current sources are
2 different, and wherein the currents increase in an exponential fashion.
- 1 23. The circuit of claim 22, wherein the base of the exponential growth is two (2).
- 1 24. The circuit of claim 16, wherein the snub resistor is coupled to the variable current source
2 with a switch, and wherein when the switch is closed, a voltage drop equal to the output current
3 of the variable current source times the resistance of the snub resistor is produced across the snub
4 resistor.
- 1 25. The circuit of claim 14, wherein the voltage varying circuit comprises:
2 a current source; and
3 a serial chain of resistors coupled in parallel to the current source, each resistor is coupled
4 in parallel to a switch, wherein each switch is controlled by a control signal, and wherein an
5 effective resistance of a resistor and switch combination is equal to the resistance of the resistor
6 when the switch is open and is equal to zero when the switch is closed.
- 1 26. The circuit of claim 25, wherein each resistor in the serial chain has essentially equal
2 resistance.

1 27. The circuit of claim 14, wherein the driver circuit comprises:
2 a first high side drive circuit coupled to a supply voltage source, the first high side drive
3 circuit to permit current from the inductive load to dissipate into the supply voltage source;
4 a second high side drive circuit coupled to the first high side drive circuit and the current
5 varying circuit, the second high side drive circuit to allow a voltage drop generated by the
6 current varying circuit to appear in the driver circuit; and
7 a low side drive circuit coupled to the current varying circuit and the inductive load, the
8 low side drive circuit to regulate the current build up across the inductive load.

1 28. The circuit of claim 27, wherein each drive circuit comprises a metal oxide
2 semiconductor field effect transistor (MOSFET) coupled in parallel with a body diode.

1 29. The circuit of claim 28, wherein the source terminals of the field effect transistors in the
2 first and second high side drive circuits are coupled together.

1 30. The circuit of claim 14, wherein the driver circuit is a low-side driver circuit.

1 31. The circuit of claim 14, wherein the driver circuit is a full H-bridge circuit.

1 32. The circuit of claim 14, wherein the driver circuit is a half bridge circuit.

1 33. The circuit of claim 14, wherein the inductive load is a solenoid mechanism for an
2 automotive brake.

1 34. The circuit of claim 14 further comprising a snub stack coupled in parallel to the driver
2 circuit and the current varying circuit, the snub stack to produce a fixed voltage drop.

1 35. The circuit of claim 34, wherein either the current varying circuit or the snub stack can be
2 enabled.

1 36. The circuit of claim 34, wherein the snub stack can offer electrostatic discharge
2 protection.